



LAND AND INFRASTRUCTURE

GISERA | Gas Industry Social and Environmental Research Alliance

The more you look, the more you'll find

Measuring seismic activity in Western Australia

There has been more and more data available on earthquakes worldwide over the past decade. But this does not necessarily mean there have been more earthquakes!

The increased amount of data is also a result of increases in the number of monitoring stations and the improved sensitivity of the instrumentation. The monitoring equipment is advancing in technology and also becoming more compact and affordable, so more and more stations are being established in places they haven't been before.

Retrieving baseline data

This is good news for retrieving data on the scale and frequency of seismic activity – both from natural and human sources. Establishing more monitoring stations in new areas can mean the recording of baseline data prior to any or further industrial development. And the increased sensitivity means we can detect small-scale events and make comparisons over time.

So how do we know the origin of seismic activity? And how can we determine whether seismic activity is the result of human activities, such as gas operations? This depends on what background natural activity is taking place (e.g. tectonic activity) and what other human activities are occurring (such as quarry blasting).

This is why more stations, greater sensitivity and recording baseline data (prior to development) are so important. It means better interpretation of any data recorded over time.

Key points:

- The increased use of improved detection systems has given us more data about seismic activity across the world.
- Collecting baseline data on naturally occurring seismic events is necessary prior to any industrial development, such as natural gas operations.
- There is still limited data on seismic activity available for the Canning Basin in WA.
- Ten stations with high levels of sensitivity have been installed in the region and soon all will have telemetering functionality to collect data in real time.
- This data can then be compared with any recordings made after planned gas developments in the region.



One of GSWA's seismic monitoring stations in the Canning Basin, WA



Closing knowledge gaps in the Canning Basin

The Canning Basin, situated in northwest Western Australia, is the largest sedimentary basin in WA. There has been a moderate amount of long-term natural seismic activity in this area, most notable was a recent cluster of earthquakes off the coast of Broome, which produced a magnitude 6.6 event and was felt in Perth, 1,500 km away.

Measuring this activity historically has been limited due to the lack of seismic monitoring stations in the region – previously, only four permanent stations had been deployed in the basin. These stations alone cannot detect or locate events less than magnitude 2.5. The Geological Survey of Western Australia (GSWA) have installed and are operating a dense seismic monitoring array in the basin, which has a sensitivity detection range for magnitudes as low as 1, and maybe even lower. This improved sensitivity, increased number of sensors and closer locations will greatly increase the potential for detecting more and much smaller seismic events across the basin.

Measuring impacts of gas development

There is considerable potential for developing shale and unconventional gas in the Canning Basin. Increasing the geological knowledge of the basin through further seismological research will aid the interpretation of any seismic activity – this can contribute to our fundamental understanding of seismic events and the potential impacts of human activities.

The Canning Basin data gathered and evaluated by CSIRO researchers will help inform communities, regulators and industry of baseline activities, and allow better discrimination of seismic sources, the impacts, and the development of any mitigation strategies.

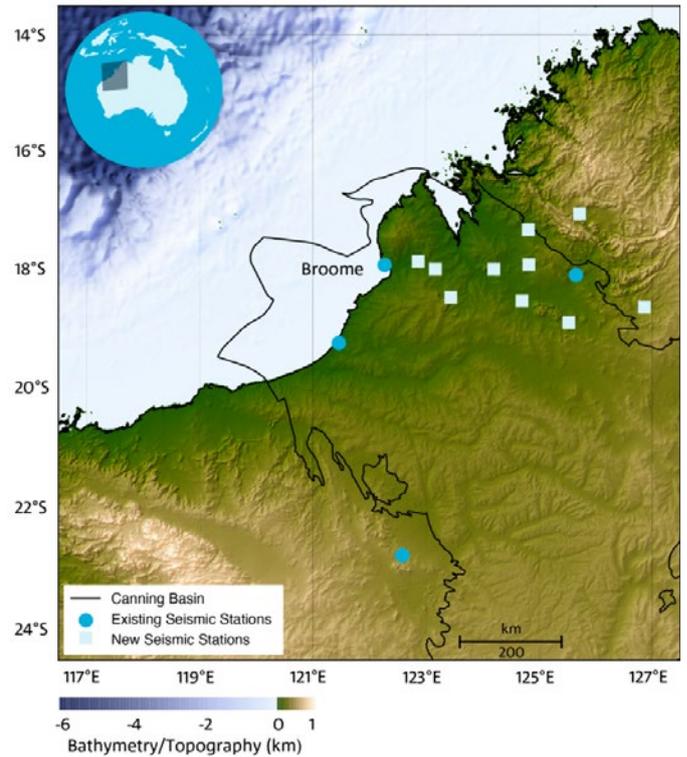
To find out more about CSIRO’s work in monitoring of seismic activity in the Canning Basin in Western Australia, go to the GISERA website.

Fast facts from GeoScience Australia

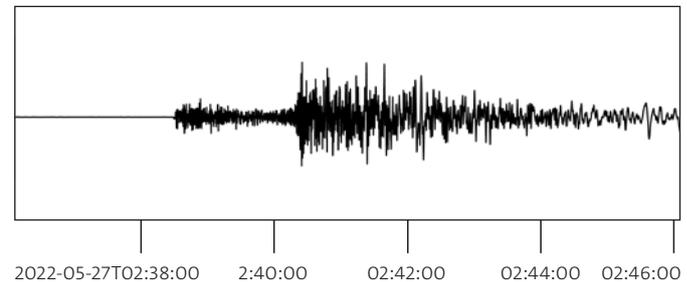
- Magnitude is a measure of the energy released by a seismic event, such as an earthquake
- Earthquake magnitude used to be measured on the Richter scale. Now it is calculated as a seismic moment – the fault area multiplied by the average displacement of the fault.
- A magnitude 8.6 earthquake releases energy equivalent to about 10,000 WWII atomic bombs!

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Canning Basin Seismic Monitoring Array



Map of the northern part of the Canning Basin, WA, showing the location of seismic stations.



Waveform plot of an earthquake that occurred in East Timor in May 2022 – this panel shows the vertical component data, recorded by the Canning Basin Array station KIM03.

Further information | 1300 363 400 | gisera@gisera.org.au | gisera.csiro.au

GISERA is a collaboration between CSIRO, Commonwealth and state governments and industry established to undertake publicly-reported independent research. The purpose of GISERA is to provide quality assured scientific research and information to communities living in gas development regions focusing on social and environmental topics including: groundwater and surface water, greenhouse gas emissions, biodiversity, land management, the marine environment, and socio-economic impacts. The governance structure for GISERA is designed to provide for and protect research independence and transparency of research.